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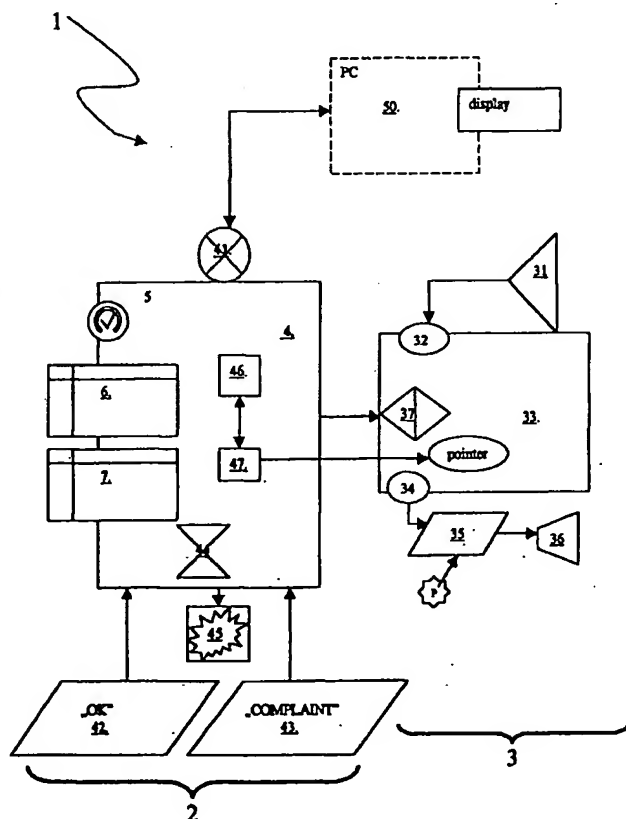
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(54) Title: PERSONAL SIGNALLING DEVICE FOR MEDICAMENT INTAKE



(57) Abstract: The subject-matter of the application is an apparatus (1) which notifies its owner to a previously programmed point of time having been reached and about actions to be accomplished in connection with it, especially a patient to take in his medicaments, the said apparatus has a central unit (4) with an I/O port (41) and an internal clock (5) and operating and display units. The characteristic feature of said apparatus is that it is provided with a sound storage unit (33) with sound signal receiver (31) and speaker (36) which unit is connected to and controlled by the central unit (4).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PERSONAL SIGNALLING DEVICE FOR MEDICAMENT INTAKE

The field of the invention

5 The solution relates to an apparatus, which notifies its owner that a previously programmed point of time having been reached and to accomplish a certain action associated with it. The said apparatus is especially designed to notify a patient to take his medicaments in. The apparatus is provided with a central unit with an I/O port and an internal clock, a coupled EEPROM store unit, as well as handling and displaying units.

10

The Prior Art

The most important moment of the clinical medical examinations and of home treatment with medicaments is, that the patient must take his medicaments prescribed by the physician according to prescribed order and points of time. There are already several methods to monitor this process, but they provide
15 only approximate results. According to a group of known solutions the medicaments should be collected in a separate storing apparatus. The disadvantages of such solutions are not only the additional work to put medicaments into the said storing apparatus, but the fact that in case when a cure requires to take in several medicaments in different quantities and in
20 different points of time, several storing apparatuses should be used, which can easily be confused. Other existing solutions use light and sound signals, but they do not enable to instruct the patient, if he should take several medicaments or combinations thereof in different points of time, or he should possibly take
25 different combinations and quantities of medicaments in different points of time. There are various known solutions displaying SMS signals, but they can be read with trouble, especially for elderly people.

The Disclosure

The purpose of proposed solution is to establish a cheap apparatus, which eliminates the above mentioned troubles and disadvantages, which the user can easily bring with himself and its usage is easy and simple for both the physician
5 and the patient.

The basis of the present solution is the recognition, that the simplest method of communication is the verbal one which the apparatus can provide either by speech synthesizer or by play back of a sound record. We prefer the programmed play pack of a recorded speech according to the results of our
10 research, because the apparatus can be simpler and cheaper and even its usage can be easier using this method. We recognized and used in the solution furthermore, that separate storage of the voice messages and the programs containing the moments of time and controlling the play back enables application of advantageous technical solutions and it does not hinder the
15 coordinated usage of two types of information at the same time.

We recognized and applied as basis of the solution that the sound record stored in a specialized IC enables an addressed storage of sound record in analog form, which enables its addressed recall. There is a wide variety of miniature devices of high power, applicable for these aims among the modern voice
20 storage devices. The IC units produced by ISD, which store the voice in analog form, are provided with direct connectors to microphone and loudspeaker and they store the voice in a non-forgetting and rewritable memory unit. Their memory units are directly accessible and addressable Their disadvantage is that the IC does not issue addressing information of the places of storage. An
25 essential feature of the recognition underlying invention is that the establishment and registration of addresses of each recorded text message being coupled with control of device enables the programmed play back of stored messages either serially or according to any groups. All the further recognitions underlying the establishment of the apparatus will be described in connection
30 with the detailed description of the solution.

On the basis of above mentioned recognitions the solution relates to an apparatus, which notifies its owner about a point of time being reached and about actions coupled with this point of time to be accomplished, especially it notifies a patient to take his medicaments. This apparatus is provided with a central unit, an I/O port and an internal clock, an EEPROM memory unit
5 connected to said central one, as well as with handling and signaling units. The apparatus built up according to solution can be characterized by that its sound storage unit provided with a sound signal receiver and a speaker unit has a control connection with the central unit.

10 The apparatus can advantageously be characterized that its sound storage unit is an addressable memory and the central unit is equipped with an addressing unit.

A further advantageous feature of the apparatus built up according to our solution is that the addressable memory is an IC which stores the recorder
15 sound in analog form.

A further advantageous feature of the apparatus built up according to our solution is that it is equipped with units suitable for an infra red light connection with a port built into physician's PC.

Another advantageous feature of the apparatus built up according to our solution is that it is equipped with a command device „OK” for its user (the
20 patient) which serves e. g. for signaling that the medicaments has been taken.

This command device is advantageously a concealed and/or sheathed push button.

Another advantageous feature of the apparatus built up according to our solution is an event signaling device „COMPLAINT” which serves to record
25 the points of time of experienced discomforts or sicknesses.

Within the apparatus built up according to our solution the event signaling device is advantageously equipped with a time controlling one and a display

one, which serves to keep the length of signal up to turning the display (expediently a LED) on to attest the willfulness of signal.

The detailed description of the solution is shown in the drawings using examples of embodiment, without limitation of both the applicability of said
5 solution and the claimed extent of protection to the shown examples.

Drawings

Figure 1 Schematic diagram of an embodiment of the apparatus according to solution

10 Figure 2 Simplified operational flowchart of the apparatus according to solution

Figure 3 A complement to the flowchart on Figure 1 for segments of messages

The apparatus 1 embodied according to solution consists essentially of an electronic unit 2 and an acoustic one 3 (see Figure 1). The electronic unit 2
15 consists of a central unit 4, an internal clock 5 connected to it, a data memory 6 and a program memory 7. The central unit 4 is equipped with an I/O port, and has a controlling connection with the units of the acoustic unit 3. The acoustic unit 3 contains a sound storage unit 33, which is a known IC in itself of type ISD2560, ISD2590 or 25120 according to required memory size for recording
20 sound of 60, 90 or 120 sec made for storing speech or musical sound in analog form and it is a multiple-times erasable and rewritable non-forgetting memory. The said IC is provided with sound signal input connections 32 sound signal output connections 34, as well as memory addressing input terminals. The acoustic unit contains a connected microphone as sound signal receiver 31 and
25 a loudspeaker with an interposed amplifier 35 as sound output device. A potentiometer is advantageously connected to the amplifier 35 to regulate the intensity of sound. The sound storage unit equipped with own intelligence is connected with the central unit 4 which includes an addressing unit 47 and an

address registering unit 46 in addition to the I/O port 41. The addressing unit 47 is a time interval measuring device which begins the measurement in seconds at a start signal 302 and ends it at the stop signal 303 and issues the measured time in storage eligible form. The address registering unit 46 is a block of memory which stores the time values in ordered form linked with other data. The central unit 4 is expediently a micro-controller the internal clock 5 is a real-time time measuring unit, both are known in themselves. The said data storage unit 6 and the program storage unit 7 are non-forgetting EEPROM-s. The connection between the central unit 4 and a physician's PC playing the role of resident device is accomplished by an „IrDA eye” connected to the I/O port. In other configurations the I/O port is connected to the physician's PC through a cable RS232. In addition, the electronic unit 2 is equipped with a command signaling device 42 advantageously with inscription „OK” and an event signaling one 43 advantageously with inscription „COMPLAINT”, both of them belong to the central unit 4, which are concealed and/or sheathed push-buttons mounted on the outer side of the apparatus 1. The command signaling device 42 is a multifunctional push-button. When the apparatus 1 is connected 403 to physician's PC 50 the button 42 held down together with the event signaling button 43 during 3 seconds a signal 404 activates the connection between the two apparatuses. During recording messages the signal 303 indicates end of each message and beginning of recording of another message respectively. The command signal button 42 held down indicates the receipt of notifying message 411 [OK] in normal operation i. e. in notifying period when programmed messages are read out. A time controller 44 and a display 45 are connected to the event signaling device 43. The latter device is a LED on the outer side of the apparatus. The display 45 issues series of signals in this case blinking light of different well recognizable periods in 301-307. The display 45 notifies the different operating modes to the user. The time controller 44 is an electronic unit, which issues a reply signal within a previously defined time period after receiving a releasing signal 305. In the acoustic unit 3 the sound signal receiver 31 is a microphone connected to

the sound input connection 32 of the sound signal storage 33 which records the sounds. The sound signal storage is the above mentioned ISD chip, which is able to store sounds in analog form on directly accessible and addressed locations or to reproduce them according to the position of mode switch 37.

- 5 The sound signal receiver 31 and sound signal storage 33 are controlled by central unit 4 especially as regards to addressing 409 of the sound signal storage 33. The apparatus 1 is a light one, its whole weight is 200 g with dimensions of e. g. 18 x 58 x 105 mm, it can be held in pocket. The power is supplied by two or four AA cells of 1.5 V.
- 10 The method of functioning and usage of said apparatus is described below (see Figure 2). A short introduction to usage of the apparatus 402 is recorded in the sound storage 33. There is a program in the program storage, which plays back automatically this short introduction when the apparatus is first time activated i. e. when the cells are put in. The play of this introduction can be repeated as
- 15 many times as desired by holding down the command signaling button 42 until the first notifying message is recorded into sound storage. At this time the introduction is erased. The physician who treats the patient, having determined the cure required for the patient, loads the points of time 405 through I/O port 41 from his physician's PC 50 into central unit 4 and the previously edited
- 20 messages for the patient are read through sound signal receiver under control of central unit 4 into sound signal storage 33 using live voice. A software tool serves to establish and to load the physician's program which pertains to the apparatus 1, but works in the physician's PC. The contents and program of play of said messages can not be changed either unintentionally or intentionally.
- 25 They can be changed only by means of physician's PC 50 and using the said software tool. During the first simple mode of application all the messages should be read in exactly as they should be reproduced. Using a more sophisticated mode of usage, the common parts of text messages [e. g.: „Hello, it is the time to take the medicaments in"] are recorded only once and the
- 30 messages will be played as mosaic of several records edited under program control. The physician lays his PC 50 and the apparatus 1 to enable the infrared

connection between them. Using transfer through cable RS232 the data will be loaded in compliance with RS232 protocol. Using the simple application the physician's program contains the patient's identifier and the succeeding points of time of notifications, to each one belongs a notifying message to be played
5 back. The physician's program declares by this way how many messages will be read in, so the memory of the sound storage unit 33 into how many fields should be divided. A connection is established between the devices by means of simultaneous holding down 404 of the command signaling button 42 and event signaling one 43 during three seconds. In another solution the time
10 controller 44 enters into operation by means of simultaneous holding down of both operating buttons, it measures a previously set time interval, the end thereof is indicated by LED 45. The operating buttons may be released in this moment. The incorporation of this condition serves to eliminate faulty switches. The established connection between physician's PC 50 and apparatus
15 1 is indicated by continuous blinking signal of display 45. The time points of taking medicines will be loaded then into apparatus 1. The IC ISD 2560 possesses a built in pointer. The messages read in are stored consecutively in this memory. It can read back messages read in several parts in as a whole one if the message separators are eliminated. It plays back several messages read in
20 according to sequence of reading otherwise. When the memory is full, it overwrites the content from the beginning. When playing back, it repeats the first message after the last one. Each message means a text part which contains the name of medicament and the number of tablets to be taken at the actual point of time or if several medicaments should be taken, it contains such
25 message for each medicament. So many messages should be read into sound storage unit 33 which make the cycle e. g. daily cycle up. Three messages are necessary for a cycle of time points of morning, noon and evening. The verbal message will be read in by the following method. The program containing the time points for taking the medicaments is already loaded from the physician's
30 PC 50 into apparatus 1. The physician or his receptionist sets the apparatus 1. by holding down the command signaling button 42 and the event signaling one 43

simultaneously for a short time into message recording mode 406. The central unit 4 sets then the mode switch 37 of the sound storage unit 33 into record status 301. The initial address (00 sec) of the sound storage unit 33 is then recorded in the program memory 7 to the first message, the pointer of the sound storage unit 33 is set to the address 00 and the LED of the display 45 issues single flashes separated with long pauses indicating that the first message follows. The operator starts the recording by pressing 302 the command signaling button 42 and reads continuously the message into sound signal receiver 31. The addressing unit 47 starts at the same time and runs synchronized with the pointer of sound storage unit 33. During the reading of message the display 45 issues a continuous equally blinking signal. The operator pushes again 303 the command signaling button 42 at the end of reading of the first message. The pointer of sound storage unit 33 stops and the internal intelligence of ISD puts a message separator into the memory to the end of message read in. The next message to be read in begins at this point. The addressing unit 47 stops simultaneously and saves the measured time length into address registering unit 46, which is the memory address according to pointer setting at the same time, for the second point of time of the program of taking medicaments. The central unit 4 sets automatically the mode switch 37 to status play back 304 and plays back the last message read in for checking, during this time the display 45 issues continuous equally blinking signal, as well. The automatic device switches into status „recording” 307 again and includes a wait of 10 sec 305. The operator can decide then whether he wants to correct the last message or he wants to continue the work with reading the next message in. If the apparatus 1 gets no signal 306 during this wait, it sets the pointer of sound storage unit 33 to the beginning of last message read in and waits for the reading of corrected message, to overwrite the last message therewith. While the correcting message is read in, the addressing unit 47 functions as during the original reading, because it is not sure, that the time length consequently its storage requirement is the same as of the previous one. The central unit 4 overwrites the previously stored end address (i. e. the

beginning address of the next message) with the end address of the corrected message. If the operator does not wish to correct the message, he presses the command signaling button 42 giving an OK signal 307 then the apparatus 1 sets itself ready to receive the next (in this example second) message which the display 45 indicates by double flashes separated by long pauses (it means that the second message follows) If the connection between the apparatus 1 and physician's PC 50 exists during the messages will be read (because the above mentioned detachment relates only to the program loading from PC 50 to apparatus 1), the filling of the sound storage unit 33 with messages can be followed on the monitor of PC. This connection exists without any obstacle using RS232. It makes troubles to keep up infrared connection because the IrDA units should be optically connected while the messages are read in, but during this time the apparatus 1 should be held in hand for comfortable handling. The duration of separate messages should be previously planned and checked if they fit surely to capacity of the IC ISD (60, 90 or 120 seconds) used as sound storage unit 33. The intensity of sound of the issuing unit 36 can be regulated by means of a potentiometer connected to the amplifier 35 during control hearing of messages 304. Having recorded the last message, the apparatus 1 sets itself into mode „normal operation” 407 after a check 307. The majority of units of apparatus 1 are detached from the power supply and the apparatus 1 is in „standby” mode in „normal operation” i. e. when programmed play back of notifying messages is going on. The central unit 4 observes continuously 408 the internal clock 5. The internal real time clock sends each second an interrupt signal 501 being releasing one at the same time to the central unit 4. The central unit 4 compares each time the actual time 502 with the forthcoming point of time called from program memory 7 when medicaments should be taken. When the point of time to take medicaments is reached, the central unit 4 starts the play back 409 of the actual message 410 from the sound storage unit 33 through the sound issuing device 36. Having completed the play back, the apparatus 1 waits for the answer 411 of the patient. If the answer fails, it repeats the message several times according to its

program until it receives an OK signal by the command signaling button having been pressed. The central unit 4 stores the receipt of signal together with its point of time into data memory 6. When the answer fails after completing the programmed number of repeated notifications, the point of time is stored into data memory with failure mark. The internal intelligence of IC-s of ISD type does not enable to repeat the message: if the signal is repeated, it plays back the next message. It is the single possibility to repeat the message plaid back, when the central unit 4 sends an addressing instruction to the sound storage unit through its addressing input connections. The memory of the ISD storage unit is not really divided into sectors (stacks), so it cannot be addressed by this way. The ISD can be addressed only using its own pointer. Nevertheless, the ISD does not issue any information about the setting of its pointer at the end of any message or at the beginning of any following one, so the addressing inputs cannot be used as output. According the invention the problem is solved that if any message should be repeated, the address 409 pertaining to the given message is put from address registering unit 46 into ISD through addressing input connections of the sound storage unit 33, so it sets the pointer of the sound storage unit 33 to the beginning of the message which should be plaid back. The apparatus 1 would be useless for practical purposes without a necessary number of repetition of messages because the information contained in any message cannot be noted at the first time for the majority of patients. The patient can use the event signaling button 43 of the apparatus 1 if he feels some unusual or inconvenient symptoms and he attributes it to the cure being in progress. The event signaling button 43 should be held down until the program in the time controller 44 terminates and the display 45 in this example the LED turns on indicating its end. The event signaling button 43 should be then released. The central unit 4 receives the signal given by the event button 43 and records it as COMPLAINT signal only if both conditions are fulfilled, i. e. the button is held down until the prescribed time period expires and then it is released. The signals COMPLAINT are recorded together with their time points. The physician can draw valuable conclusions from these data, e. g. from

distance between the point of time of taking medicament and the one of COMPLAINT signal. The apparatus 1 repeats the series of messages 412 every day until the cure expires. On the day of expiration of the cure 414 the patient returns to the physician and the OK answers, the fail signals, the time points of COMPLAINT ones given by event signaling button 43 and data identifying the patient can be loaded from the data memory 6 of the apparatus 1 connected to the physician's computer 50. Although the apparatus 1 cannot control whether the medicaments were really taken, nevertheless the data provide the physician with useful information about both the therapy and compliance behavior of the patient.

The notifying messages are segmented at more complex applications (see table I) of the apparatus 1. The segments (e. g. „two tablets of Aspirin”, „one tablet of Aspirin”, „one tablet of Venoruton”) are read in only once and effectively all output messages are combined of chosen segments (see table II). The segments are provided with serial number according to order in which they are read in. The addresses of segments in the sound storage unit 33 are unknown, but the addressing unit establishes the addresses during reading in and puts them in the address registering unit 46 exactly in the same order as they were previously numbered. In this configuration the physician's program contains the serial numbers of segments comprising the messages and in such order as they should be composed (see table II). In the time point when a message should be played back the central unit 4 sets the mode switch 37 of the sound storage unit 33 to the position of play back, sets the pointer to the address of first segment 409a and plays its text 410 back (see figure 3) then sets the pointer to the following address and plays it back, and at repetition it plays back the whole message by such way. The capacity of a basic ISD memory unit is 60 seconds. This limit can be utilized much more effectively using segmentation of messages. The physician's program and the reading in the messages should be planned and harmonized, however, much more accurately.

The apparatus 1 built up according to invention is new, because it realizes an all-round highly intelligent device for notifying a patient, having dimensions and weight not much more than a box of safety matches. The solution according the invention builds the recording and playing back sound messages
5 upon an ISD unit with own intelligence which is known in itself, but the apparatus 1 provides services and has a scope of applications which highly surpasses the level expected from a devise constituted by an ISD and a micro-controller. It is obvious from the prior art, that the an ISD controlled by a micro-controller can have a wide range of applications, but it is the solution
10 surpassing the knowledge required from an expert, that a real addressability is established substantially under control of a calculator for an ISD memory unit instead of a quasi one using its pointer.

The solution according to invention enables to play back messages of whole extent surpassing the capacity of the applied ISD memory unit, without
15 extension the apparatus or using more complex structure. The usage of said apparatus is simple, it can be easily learned and familiarized.

Table 1

Serial No. of segment	Text of message segment	Duration
message segment 1	It is the time to take the medicaments in. Please take	12 seconds.
message segment 2	one tablet of A	9 seconds
message segment 3	two tablets of A	9 seconds
message segment 4	one tablet of B	10 seconds
message segment 5	two tablets of B	10 seconds

table II The notifying messages

The time point of play back (the days of cure)	Numbers of segments to be played back	Pointer addresses of the sound storage unit 33	The text of message: „It is the time to take medicaments. Please take in ...
day 1, 8:30 morning	1; 3; 4	00; 23; 33	two tablets of A, one tablet of B
day 1, 12:30 noon	1; 3	00; 23	two tablets of A
day 1, 19:30 evening	1; 2; 5	00; 13; 44	one tablet of A, two tablets of B
day 2, 8:30 morning	1; 3; 4	00; 23; 33	two tablets of A, one tablet of B
day 2, 19:30 evening	1; 2; 5	00; 13; 44	one tablet of A, two tablets of B
day 3, 19:30 evening	1; 2; 4	00; 13; 33	one tablet of A, one tablet of B
day 4, 19:30 evening	1; 4	00; 33	one tablet of B
day 5, 19:30 evening	1; 4	00; 33	one tablet of B

table III Addressing of memory of the sound storage unit

No. of segment	1	2	3	4	5	more
duration	12+1 seconds	9+1 seconds	9+1 seconds	10+1 seconds	10+1 seconds	
address of pointer	00	13	23	33	44	55

15

Claims

1. An apparatus, which notifies its owner to a point of time being reached and about actions coupled with this point of time to be accomplished, especially it notifies a patient to take his medicaments, which is provided with a central unit having an I/O port and an internal clock, an EEPROM memory unit
5 connected to said central one, as well as with handling and signaling units, characterized by that its sound storage unit (33) equipped with a sound receiving unit (31) and a speaker unit (36) is connected with and controlled by the central unit (4).
- 10 2. An apparatus according to Claim 1 characterized by that its sound storage unit (33) is an addressable memory unit and the central unit (4) is equipped with an addressing unit (47).
3. An apparatus according to Claim 1 or 2 characterized by that the sound storage unit is an IC which stores the sound in analog form.
- 15 4. An apparatus according to any of Claims 1 to 3 characterized by that it is equipped with devices establishing an infrared connection to the Infra port in the physician's PC (50)
5. An apparatus according to any of Claims 1 to 4 characterized by that it is equipped with a command signaling device (42) for its owner (the patient) to
20 indicate the receipt of the notification.
6. An apparatus according to any of Claims 1 to 5 characterized by that the command signaling device (42) is a concealed and/or sheathed signaling button.
- 25 7. An apparatus according to any of Claims 1 to 6 characterized by that it is equipped with an event signaling device (43) for its user to record the time points of inconvenient symptoms and sick feelings which he has experienced.

8. An apparatus according to any of Claims 1 to 7 characterized by that the event signaling device (43) is equipped with a time controller (44) and a display (45).

AMENDED CLAIMS

[received by the International Bureau on 8 May 2001 (08.05.01);
original claims 1-8 replaced by new claims 1-6 (1 page)]

1. An apparatus which notifies its owner with verbal sound message to a point of time being reached, and about action coupled with this point of time to be accomplished, especially the patient to take in the medicaments, where the
5 said apparatus includes a central unit, preferably microcontroller, provided with internal real-time clock, I/O port for an outer PC, memory unit, preferably EEPROM, and a sound storage unit equipped with a sound receiving unit and a speaker unit to record and play back the desired messages, wherein the said sound storage unit is connected with and controlled by the said central unit,
10 **characterised by that,**
the sound storage unit(33) is an addressable memory IC, which stores the sound in analogue form, and its pointer is controlled by the output signal of an addressing unit (47) arranged in the central unit(4), wherein the said addressing unit (47) is equipped with an address registering unit(46) for recording and retrie-
15 ving the plurality of addresses concerning of the different messages recorded in the sound storage unit (33).
2. An apparatus according to Claim 1 characterized by that it is equipped with devices establishing an infrared connection to the Infra port in the physician's PC(50).
- 20 3. An apparatus according to Claim 1 or 2 characterized by that it is equipped with an command signaling device (42) for its owner (the patient).
4. An apparatus according to Claim 1 to 3 characterized by that it is equipped with an event signalling device (43) for its owner (the patient).
5. An apparatus according to Claim 3 or 4 characterized by that the command
25 signaling device (42) is a concealed and/or sheathed signalling button.
6. An apparatus according to Claim 4 or 5 characterized by that the event signalling device (43) is equipped with a time controller (44) and a display (45).

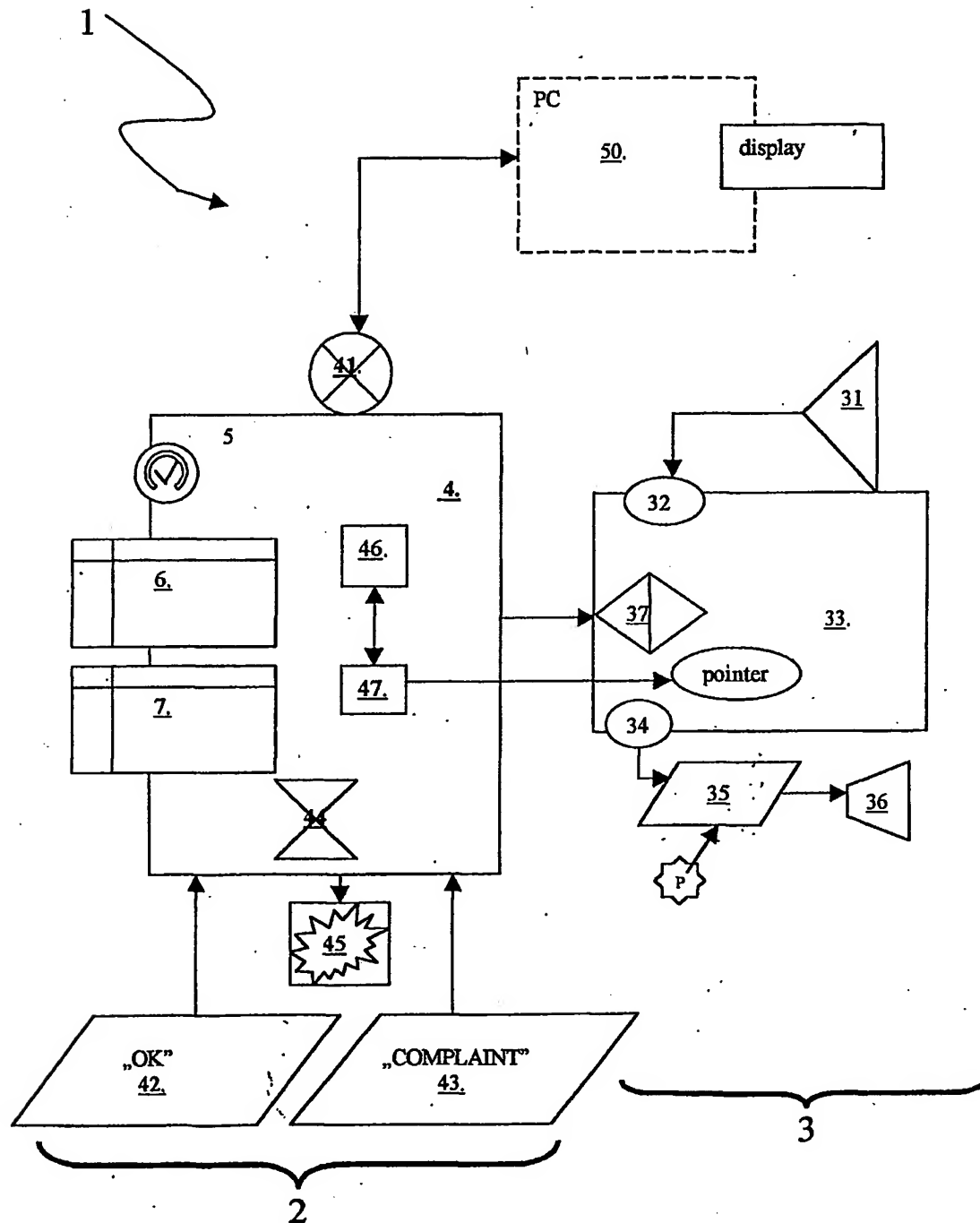
Statement under Article 19

The difference between the original and the new claim 1 is that the new claim 1 includes in its main part the characteristic part of the original claim 1; the new characteristic part of the claim 1 includes the original claims 2 and 3 supplemented with the text " its pointer is controlled by the output signal of an addressing unit (47) " and "the said addressing unit (47) is equipped with an address registering unit(46) for recording and retrieving the plurality of addresses concerning of the different messages recorded in the sound storage unit (33)".

All changing are based on the priority document and the original international filing.

The changes and the above mentioned supplement text is based on the sheet 5: lines 1-4; sheet 8: lines 9-19; sheet 10: lines 5-19 of original disclosure, and 409 step of Figure 2 on sheet 4/3.

1/4

**Figure 1**

2/4

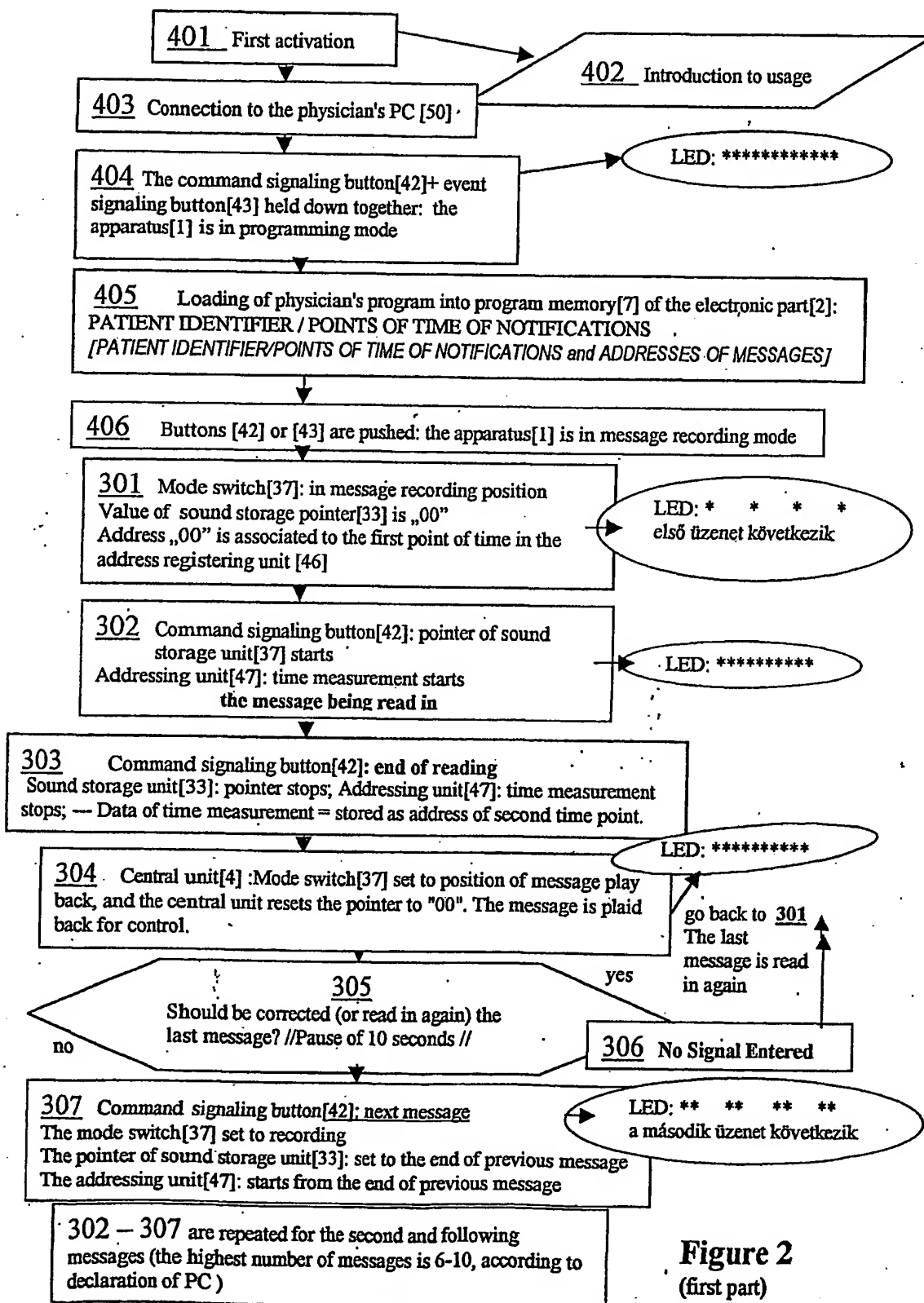


Figure 2
(first part)

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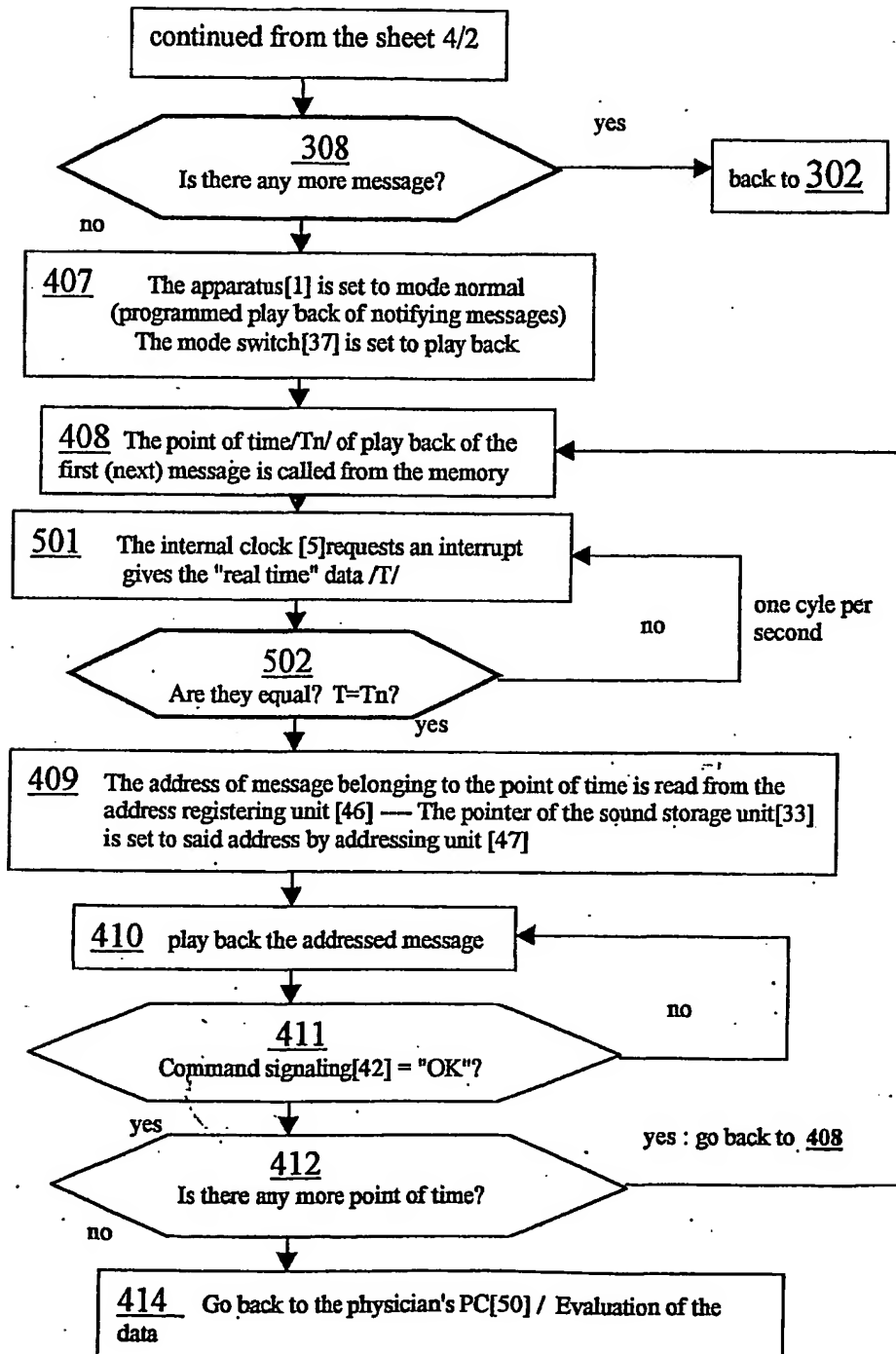


Figure 2 (second part)

4/4

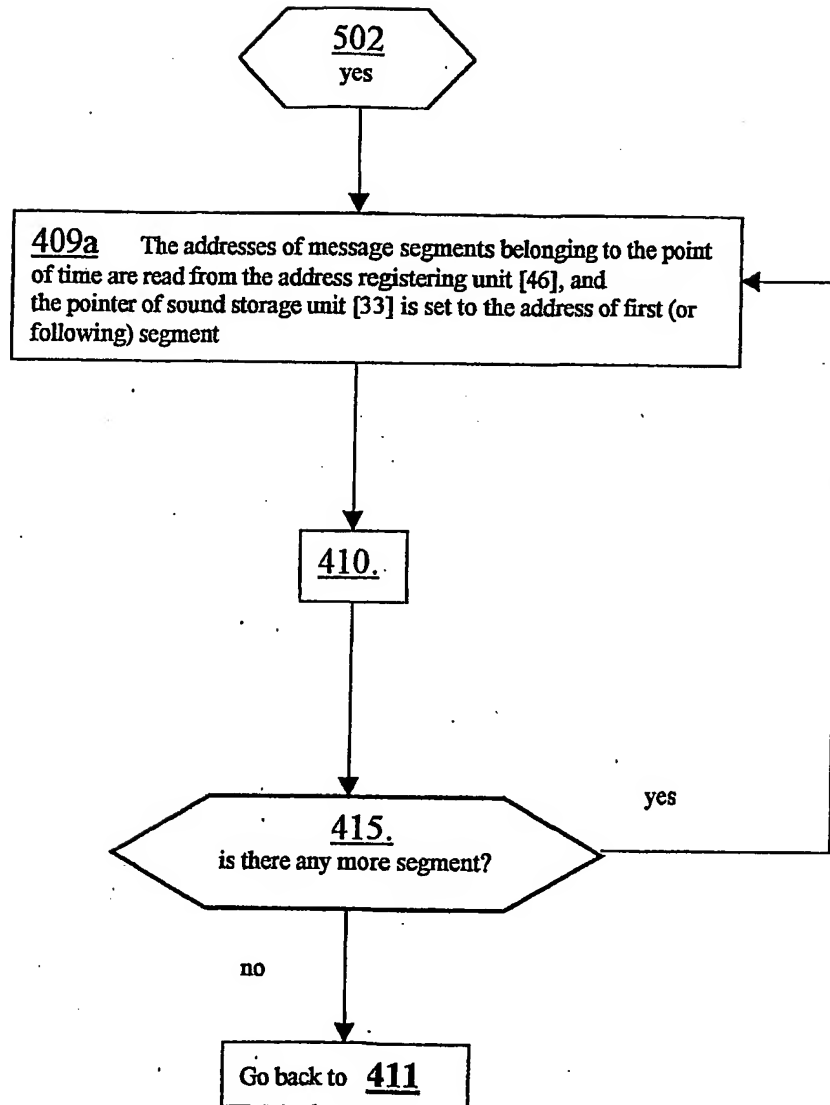


Figure 3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/HU 00/00118

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61J7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 49659 A (SEKURA CAROL M ;SEKURA RONALD D (US)) 5 November 1998 (1998-11-05) page 5, line 5-21 page 14, line 21 -page 15, line 6 page 18, line 28 -page 19, line 12 figure 7	1,2,4-6
Y		3,7,8
X	US 5 752 621 A (PASSAMANTE ANTHONY P) 19 May 1998 (1998-05-19) column 12, line 1-14 figure 6	1-3,5,6
A	column 12, line 61-65 -/-	4

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *A* document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

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